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<p>(21) International Application Number: PCT/GB00/00858 (22) International Filing Date: 9 March 2000 (09.03.00) (30) Priority Data: 334641 11 March 1999 (11.03.99) NZ (71) Applicants (for all designated States except US): PAUL, Henry [NZ/GB]; 50:50 International Limited, Premier Crew Sports Management Limited, 163A Ashley Road, Hale, Altrincham WA15 9SD (GB). PAUL, Robert [NZ/GB]; 50:50 International Limited, Premier Crew Sports Management Limited, 163A Ashley Road, Hale, Altrincham WA15 9SD (GB). (72) Inventors; and (75) Inventors/Applicants (for US only): PERANO, Zebulon [NZ/NZ]; 58 Wharf Road, Ostend, Waiheke Island, Auckland (NZ). ALLEN, Wayne, Mark [NZ/NZ]; 58 Wharf Road, Ostend, Waiheke Island, Auckland (NZ). (74) Agents: PHILLIPS, Patricia, Marie et al.; Wilson Gunn M'Caw, 41-51 Royal Exchange, Cross Street, Manchester M2 7BD (GB).</p>		<p>(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).</p> <p>Published With international search report.</p>
<p>(54) Title: LACING SYSTEMS</p>		
<p>(57) Abstract</p> <p>A lacing system comprising two rows of opposed teeth (8 and 12) mounted to respective vamp sections (20 and 22) of a shoe. A lace (4) is fixed at one end (6), extends through the teeth (8, 12) and is adjustably fastened at its other end by locking means (10). Pressing on button (30) of locking means (10) releases the lace (4) allowing it to be drawn through lock (10) by pulling on tag (86), this pulls the two rows of teeth (8 and 12) together in order to fasten the shoe. Releasing button (30) once again clamps the lace (4) in place.</p>		

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Lacing Systems

The present invention relates to lacing systems and in particular, but not exclusively to, lacing systems for footwear.

Shoes using shoe laces to retain the shoes in place on the feet of a
5 wearer, have the drawback that it is difficult for a child or disabled person to tie and untie the laces. Also, it is a labourious task for parents to teach their child how to tie laces and they can develop back strain from frequent stooping to refasten their child's laces; necessary because the laces have a tendency to loosen and thereby present a tripping hazzard.

10 It is an object of the present invention to provide a lacing system which overcomes or alleviates the above described drawbacks.

15 In accordance with one aspect of the present invention there is provided a lacing system comprising a lace, a series of opposed lace retaining means, an anchor for fastening the lace at one end of said lace retaining means, and locking means for selectively clamping the lace at the other end of said lace retaining means.

20 Preferably, the locking means comprises at least one of the lace retaining means.

Preferably, the locking means comprises at least one clamp remote from said lace retaining means.

Preferably, the locking means comprises a manually operable release mechanism

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Preferably members of the lace retaining means are mounted on a brace.

Preferably the remaining members of the lace retaining means are mounted to the lace.

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Preferably the lace retaining means comprises a plurality of teeth each having a lace receiving through-bore.

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Preferably the lace retaining means comprises a plurality of pulleys.

Preferably the lace retaining means comprises means for receiving a second lace.

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In accordance with a second aspect of the present invention there is provided a lacing system having a row of lace receiving members mounted

to the edge of an opening, a second row of lace receiving members mounted to an opposite edge of said opening, and a lace linking said lace receiving members which lace is fixed at one end and is selectively clampable at its other end, whereby when said other end of the lace is pulled the lace is tensioned through the lace receiving means drawing them together and thereby closing said opening.

Preferably the edges of the opening are the vamp sections of a shoe.

By way of example only specific embodiments of the invention will now be described with reference to the accompanying drawings in which:-

Fig. 1 is a perspective view of a lacing system constructed in accordance with one embodiment of the present invention;

Fig. 2 is an exploded perspective view of the lacing system of Fig. 1;

Fig. 3 is a detail of two oppositely disposed teeth of the system of Fig. 1;

Fig. 4 is a perspective view of the teeth of Fig. 3 showing the teeth in place on the closure edges and with a lace threaded therethrough;

Fig. 5 is a side view of one of the teeth of Fig. 3 illustrated in situ on its closure edge;

Fig. 6 is a plan view of the system of Fig. 1 illustrating the lacing system in the locked condition;

Figs. 7 & 8 are exploded perspective views of a lock tooth and lock of Fig. 1 respectively;

Fig. 9 is a perspective view of a lock of Fig. 1;

Fig. 10 illustrates stepwise the opening of the lacing system;

Fig. 11 is a schematic view of a second embodiment of lacing system, illustrated in the closed position;

Fig. 12 is the lacing system of Fig. 11 illustrated in an open condition;

Fig. 13 is a detail of one of the teeth of Fig. 11;

Fig. 14 is a schematic view of a third embodiment of lacing system;

Fig. 15 is a detail of one of the teeth of Fig. 14;

Figs. 16 to 39 are perspective views of further embodiments of lacing systems; and

Figs. 40 to 42 show schematically various applications and the lacing systems.

Referring to Figs. 1 to 10 a first embodiment of lacing system 2

comprises a single lace 4, an anchor 6, two rows of opposed lace retaining members 8, 10 and 12, 14 in the form of interdigitable teeth and a lace tightening and securing mechanism 14, 16, 18.

In the first embodiment teeth 8, 10 are mounted on a closure edge or binding 20, whilst teeth 12, 14 are mounted on an opposed closure edge or binding 22. In use each binding is fixed to respective opposite edges of a gap/opening in an item/garment to be secured/fastened together by the locking system, for example opposed vamp sections of a shoe. The edge of the binding remote from the teeth is reinforced to facilitate its attachment to the item by stitching, adhesive, welding etc.

As best illustrated in Fig. 2 each tooth 8, 10, 12, 14 carries a longitudinal slot 24 which is adapted to seat on its binding 20 or 22 and is securely fixed to that binding by suitable means for example stitching, adhesive, welding etc.. Alternatively the teeth are formed integrally with the binding, for example by molding, casting etc. Each tooth also carries a through passage 26 for receiving the lace 4 therethrough and in use the lace 4 is alternately threaded through oppositely disposed teeth 12, 8..... 12, 8, 14, 10.

One end of the lace 4 is attached to anchor 6 which prevents that

end of the lace being drawn through passages 26 in the teeth. Anchor 6 is reinforced and in use is attached to an item utilising the lacing system by stitching, adhesive etc. In use the opposite end of the lace 4 is tensioned, i.e pulled by the user and this draws teeth 8, 10 and 12, 14 towards each other whereby they mesh and close the gap between the bindings 20 and 22, thereby fastening any gap to which the lacing system is attached.

In order to lock the lacing system in the drawn/closed position tooth 10 comprises a button operated locking mechanism as best illustrated in Fig. 7. Lock tooth 10 has a blind-bore 28 disposed transversely to passage 26, a button 30 with a bore 32, and a spring 34. In use lace 4 is threaded through passages 26 and 32 and this retains button 30 within bore 28. Spring 34 is seated at the base of bore 28 and acts to bias button 30 out of said bore 28, this force acts to force lace 4 out of the bore 26 into bore 28 thereby locking it in place. To release the trapped lace 4 a user simply depresses button 30 to force realignment of bore 32 with bore 26 and thereby allowing free movement of the lace through bore 26.

Tooth 14 has a shoulder 36 which acts to cushion the locking tooth 10.

Excess lace, which has been drawn through the teeth can be firmly

kept in place by further locking mechanisms 16, 18. Lock 18 as best illustrated in Fig. 8, functions similar to locking tooth 10 and comprises blind bore 38, button 40 with notch 42 and spring 44. The longitudinal through passage 26 is however replaced by a slot 45 which simply allows the user to insert the excess lace. The base 46 of the lock 18 is reinforced to facilitate its attachment to an item by stitching, adhesive etc. Lock 16 as best illustrated in Fig. 9 also comprises a reinforced base 48 to facilitate its attachment to said item and a flap 50 into which the lace can be inserted. In order to more firmly secure the lace therein the inside surface of the flap is roughened or comprises a plurality of serrations 52.

Fig. 10 illustrates the reopening of a gap closed by the lacing mechanism by depressing button 30 the lace is released and by pulling on bindings 20 and 22 the teeth are pulled apart.

As best illustrated in Fig. 4, the longitudinal through passage 26 in each tooth 8, 10, 12, 14 is curved which allows the lace, when tensioned to exert a larger force on that tooth. Although a curved passage has been illustrated, it is to be understood that other shapes are possible.

In a second embodiment of lacing system as illustrated in Fig. 11 to 13, the teeth 8, 12 comprise a rounded end 54 having a curved guide

surface 56. The lace 4 is threaded through the teeth and about the guide surfaces 56. The thus formed lacing system is effectively a pulley system allowing a more efficient closing of the gap. In this instance bindings 20 and 22 are combined to form a substantially U-shaped binding and anchor 6 is attached thereto.

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In a third embodiment of lacing system, as best illustrated in Figs. 14 and 15, the rounded guide surface 56 is replaced by a moving pulley/wheel 58. This allows the teeth to be pulled more in line during tightening and thereby allow a greater tightening of the lacing system.

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In the embodiments, as best illustrated in Figs. 16 to 20, alternative shape of teeth are illustrated. In the embodiment of Fig. 21, not all of the teeth are connected to the bindings 20, 22, in this instance, centrally located teeth 60 are only held by the lace and in this instance the lace is connected to anchor 6 at its mid-way point and both ends are threaded through the teeth, the central teeth 60 having two through-bores 26 to allow both ends of the lace to be threaded therethrough and by this means retain the teeth 60 in place.

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In the embodiment of Fig. 22 an alternative mounting to the binding is illustrated in which the teeth 8, 12 are attached thereto by a further lace

or laces 62. This allows the insertion of a decorative lace, which can be replaced as desired.

The embodiment of Figs. 23 and 24, are similar to that of Fig. 21, except that two laces are used instead of one, each of which is anchored at one end and are selectively locked by locking tooth 10 at the other end of the system. Fig. 23a illustrates a detail of locking tooth 10.

Figs. 25 and 26, illustrate an embodiment of the lacing system adapted to fit into an existing shoe design whereby teeth 8, 10, 12 have a further through passage 64 through which a further lace 66 can be threaded, lace 66 being used to tie the lacing system into eyelets 68 on the shoe vamps. Anchor 6 in this instance may be an existing tag on the shoe. The embodiment of Fig. 27 shows the further adaption of the design to an existing shoe incorporating clips 70. This more readily facilitates the replacement of the lacing system with one of a different design.

In Fig. 28 an alternative to the locking system is illustrated comprising a lock base 72, for attachment to an item to be tied by the lacing system. Lock 18 comprises an elongate lever 74 with tabs 76 which allow insertion of the lever 74 at a desired fixing position 78 within base 72. Tag 78 is provided to facilitate removal of the lever 74 from the locking

base 72.

A further alternative locking mechanism is illustrated in Fig. 29, in this instance lace 4 is guided through tube 80 located on the ankle region 82 of a shoe, a winding mechanism 84 winds up excess lace 4.

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In Figs. 30 to 33 an alternative lacing system is illustrated. In Figs. 30 and 31 the lacing system is shown in the open and closed configurations respectively. In this embodiment the path followed by the lace 4 through the teeth 8, 12 is sinusoidal (as best illustrated by the dot-dash lines in Fig. 32), this increases the closing force, that is the pulling together of the row of teeth 8 with the row of teeth 12. The through-passage 26 for the lace through each tooth is substantially oval (as best illustrated in the side view of a tooth shown in Fig. 33), which reduces friction on the lace 4 as it is drawn therethrough. An end section 90 at the edge of the tooth, adjacent the end of the through-passage 26 is cut-away in a curved manner to further reduce friction to the lace. The end anchor 6 has a through-bore to receive the lace therethrough, the lace being secured thereon by a knot 92. Fig. 34 illustrates a view in the direction A of the anchor 6 from which a groove 94 around the periphery of the anchor 6 is illustrated, about which the lace can be wound.

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In Fig. 34 a further embodiment of lacing system is illustrated in which the rows of teeth 8 and 12 are each formed in a single moulded piece, with the lace 4 passing through in a sinusoidal manner (as best illustrated in the detail of the teeth in Fig. 35), for this means the through-passage 26 is oval (as best illustrated in the side view of a tooth in Fig. 36) as per the previous embodiment.

In the embodiment of Fig. 37 the interlocking teeth are moulded into the fabric of a shoe. As best illustrated in Fig. 38 (illustrating a plan view of an attachment of a tooth to the shoe vamp) and Fig. 39 (showing the view in direction of arrow B of Fig. 38).

Fig. 40 illustrates the use of the lacing mechanism on a shoe, in this embodiment the locking mechanism 16, 18 is replaced by a tag 86 which facilitates gripping of the lace 4. The tag 86 is releasably secured to the side of the shoe by Velcro (RTM).

Figs. 41 and 42 illustrate various applications for the lacing mechanism, wherein Fig. 31 illustrates its use to secure the neck of a shirt and Fig. 42 shows its use in adjusting the size of a cap. Other applications of the lacing mechanism will include for example a means for closing a bag, etc.

The binding can be made of any material that is strong, flexible and durable, for example a pliable plastics strip. The teeth and the lace could be made of the same material or have the same textile strength, thereby reducing the incidence of frictional damage/wear. The surface texture of the lace could be adapted to aid gripping, that is it could have a roughened surface. The teeth and the locks could be made of the same material, for example plastic, PVC, polycarbon etc. The locks could also comprise a hook which will aid in gripping the lace.

Claims

1. A lacing system comprising a lace, a series of opposed lace retaining means, an anchor for fastening the lace at one end of said lace retaining means, and locking means for selectively clamping the lace at the other end of said lace retaining means.

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2. A lacing system according to claim 1, wherein the locking means comprises at least one of the lace retaining means.

3. A lacing system according to any one of claims 1 or 2, wherein the locking means comprises at least one clamp remote from said lace retaining means.

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4. A lacing system as claimed in any one of the preceding claims, wherein the locking means comprises a manually operable release mechanism.

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5. A lacing system as claimed in any one of the preceding claims, wherein members of the lace retaining means are mounted on a brace.

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6. A lacing system as claimed in claim 5, wherein the remaining members of the lace retaining means are mounted to the lace.

7. A lacing system as claimed in any one of the preceding claims, wherein the lacing retaining means comprises a plurality of teeth each having a lace receiving through-bore.

8. A lacing system as claimed in claim 7, wherein the lace receiving through-bore is curved.

9. A lacing system as claimed in any one of the preceding claims, wherein the lace retaining means comprises a plurality of pulleys.

10. A lacing system as claimed in any one of the preceding claims, wherein the lace retaining means comprises means for receiving a second lace.

11. A lacing system comprising a row of lace receiving members mounted to the edge of an opening, a second row of lace receiving members mounted on opposite edges of said opening, and a lace linking said lace receiving members which lace is fixed at one end and is selectively clampable at its other end, whereby when said other end of the lace is pulled the lace is tensioned through the lace receiving means drawing them together and thereby closing said opening.

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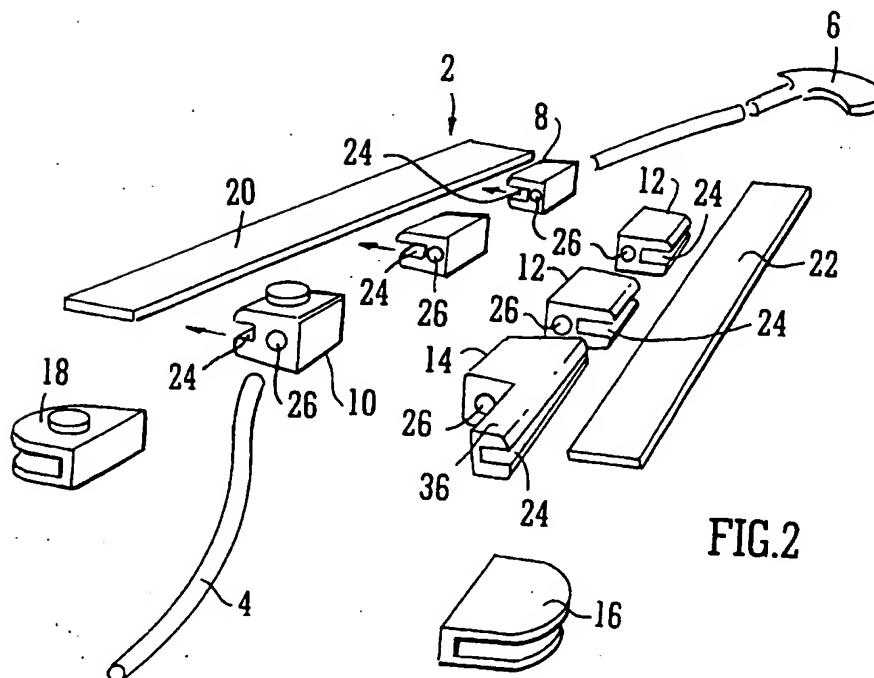
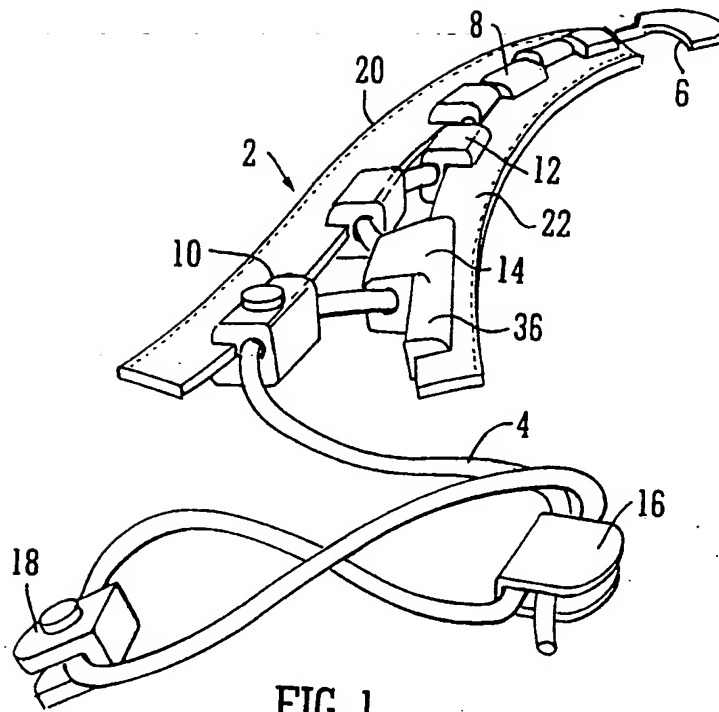
12. A lacing system as claimed in claim 11, wherein the lace subscribes a sinusoidal path through the lace retaining means.

13. A lacing system as claimed in claim 11 or 12, wherein the edges of the opening are the vamp sections of a shoe.

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14. A lacing system substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

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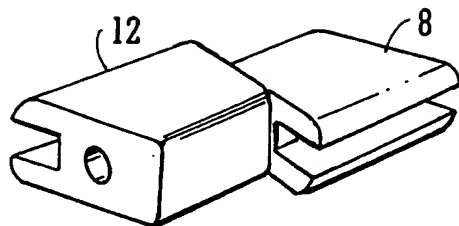


FIG. 3

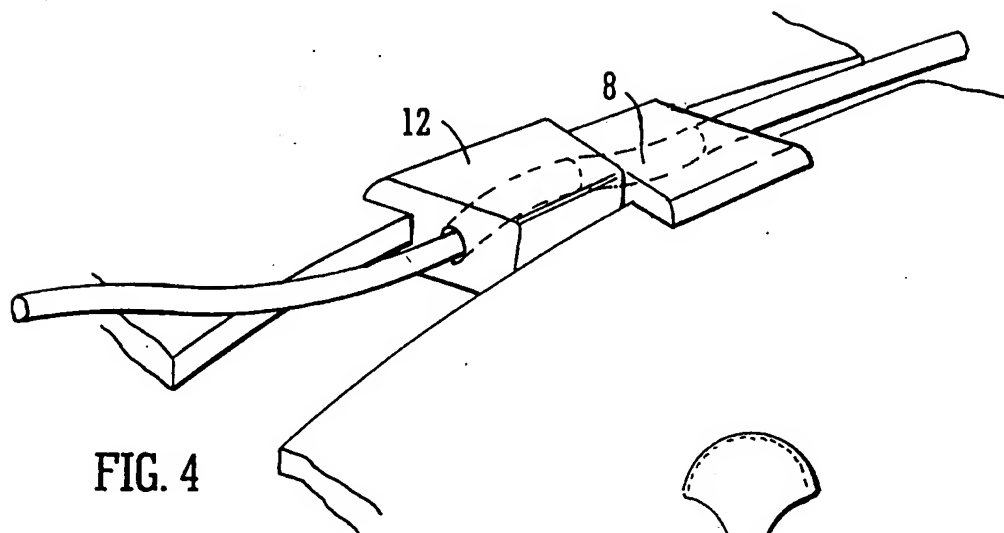


FIG. 4

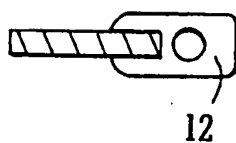


FIG. 5

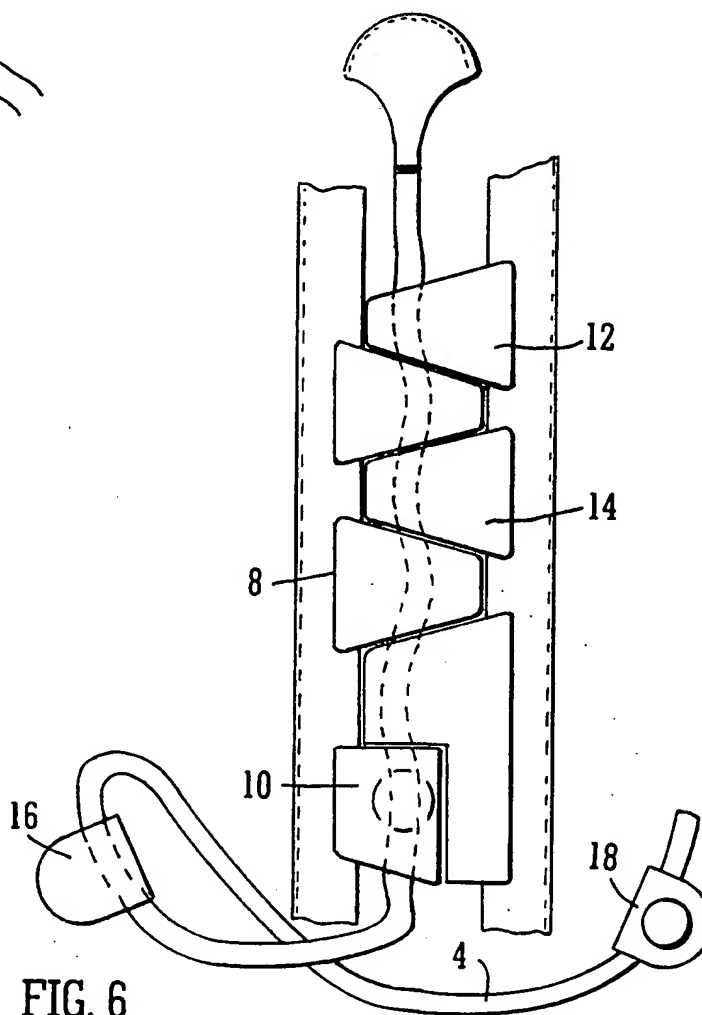


FIG. 6

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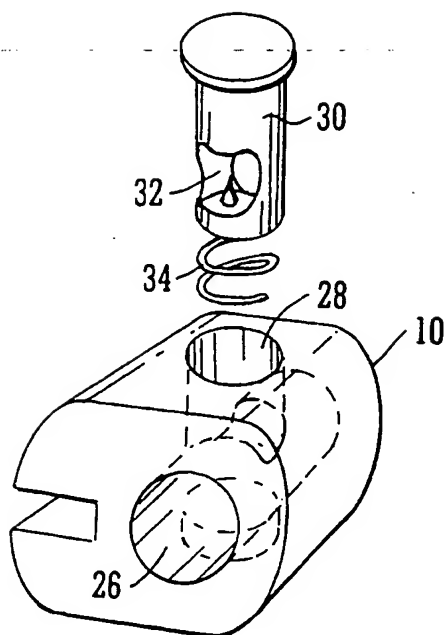


FIG. 7

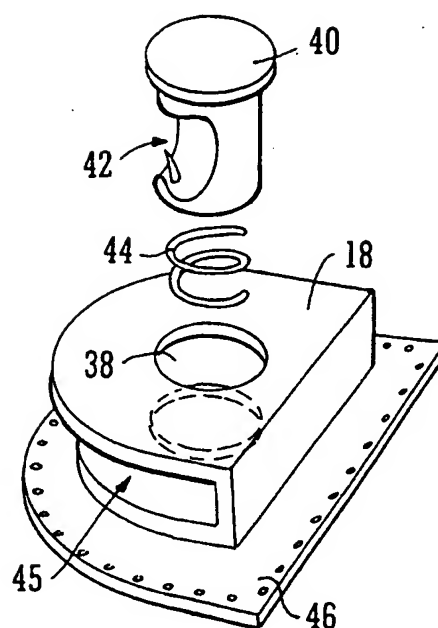


FIG. 8

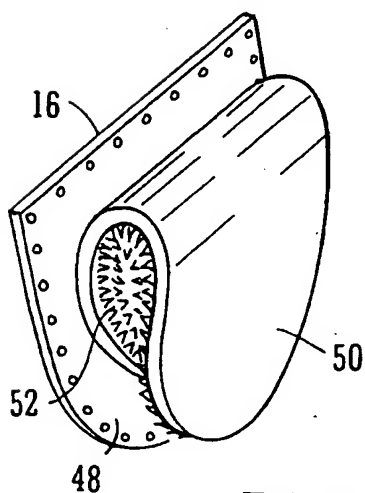
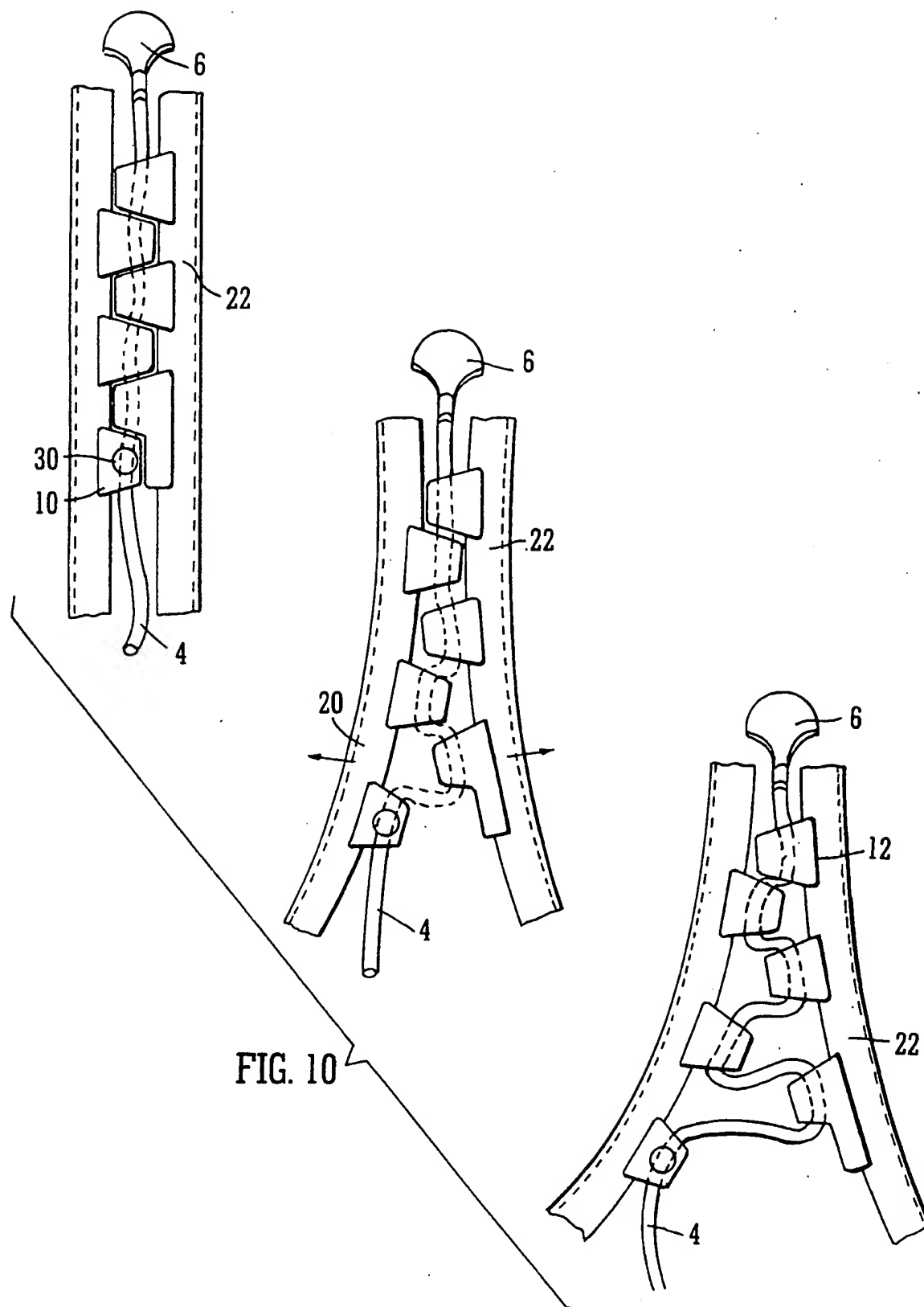


FIG. 9

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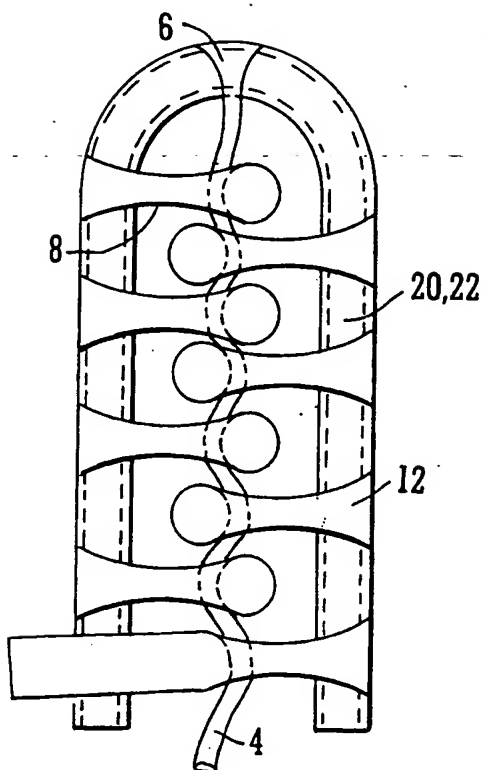


FIG. 11

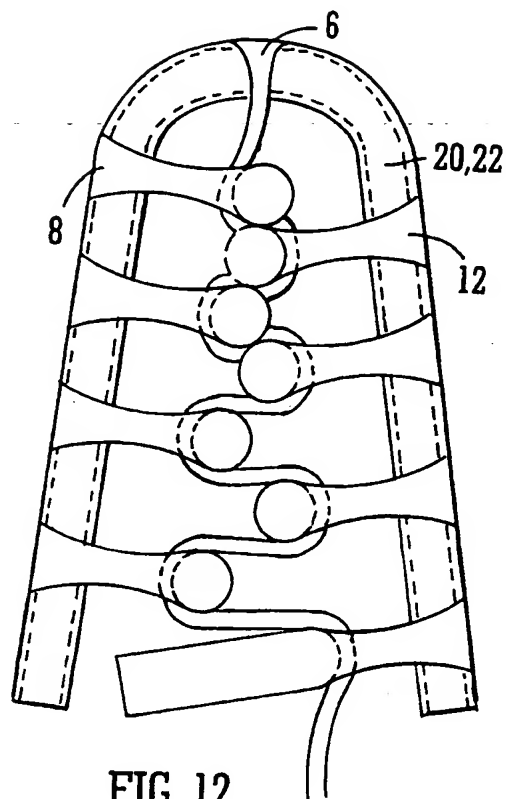


FIG. 12

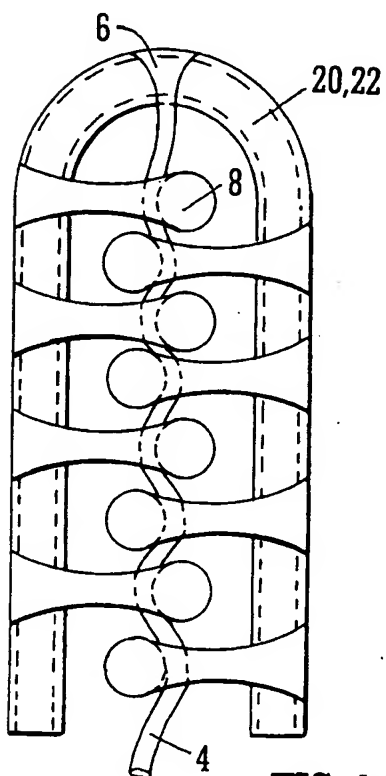


FIG. 14

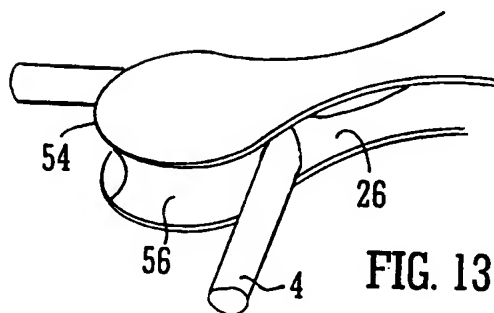


FIG. 13

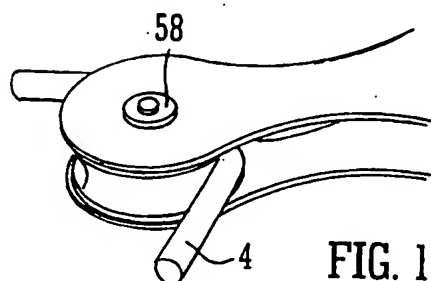


FIG. 15

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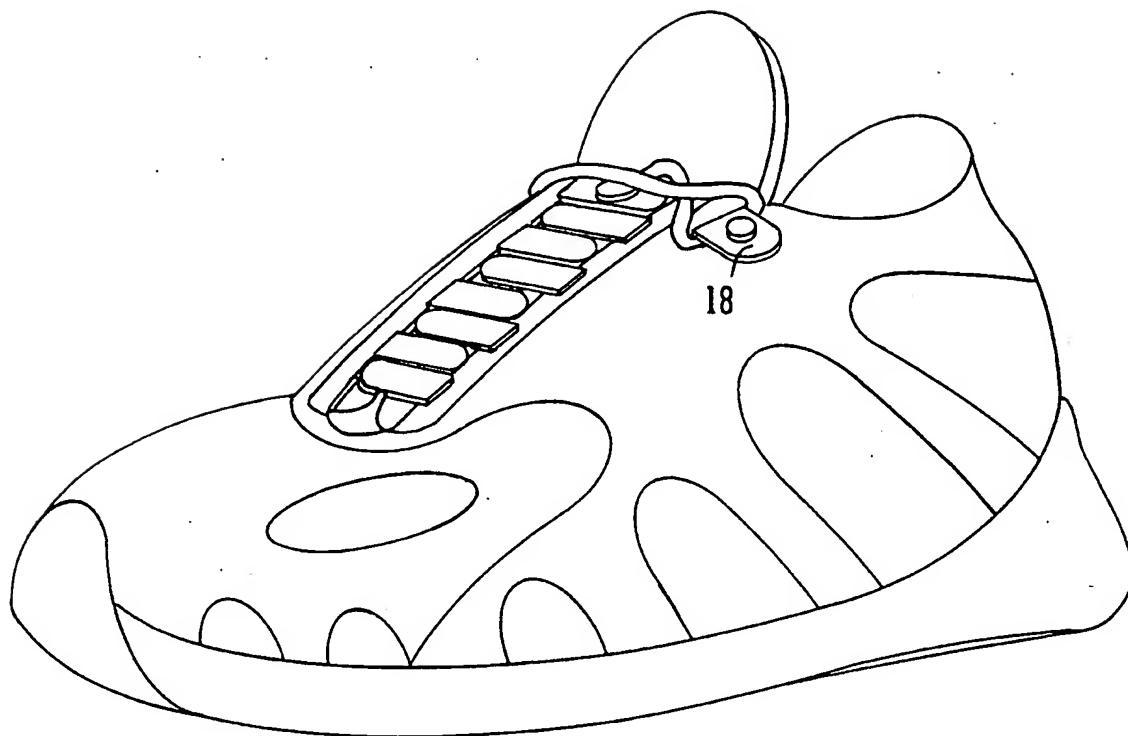


FIG. 16

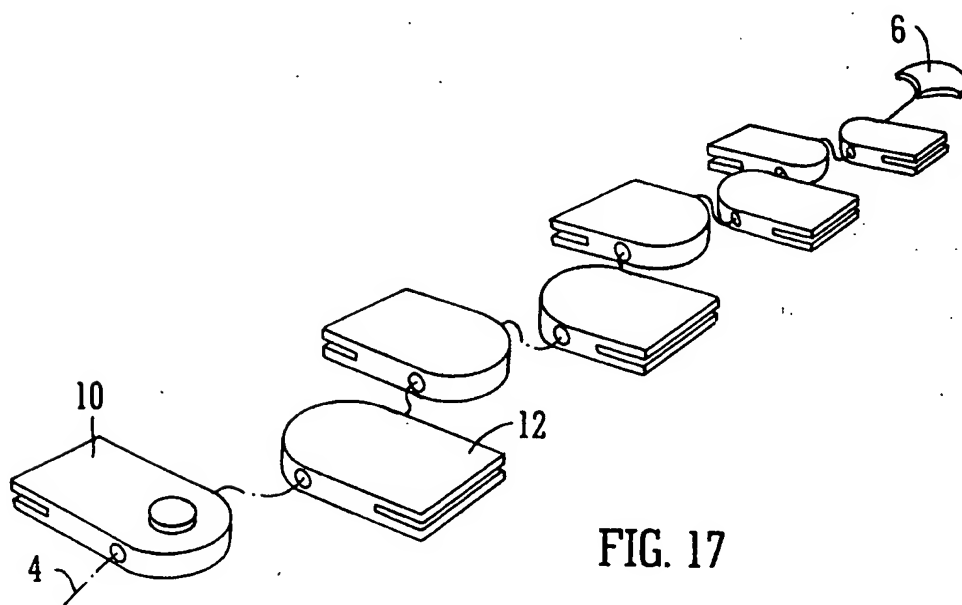


FIG. 17

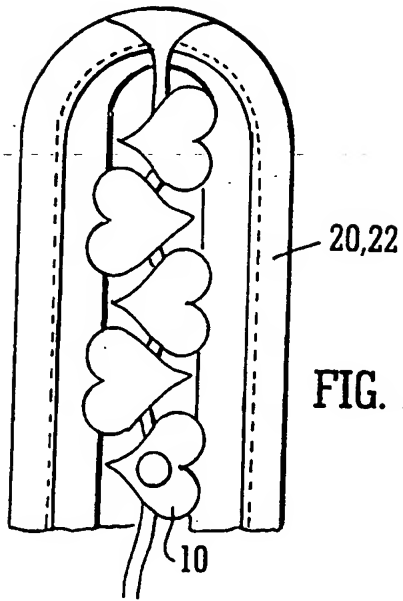


FIG. 18

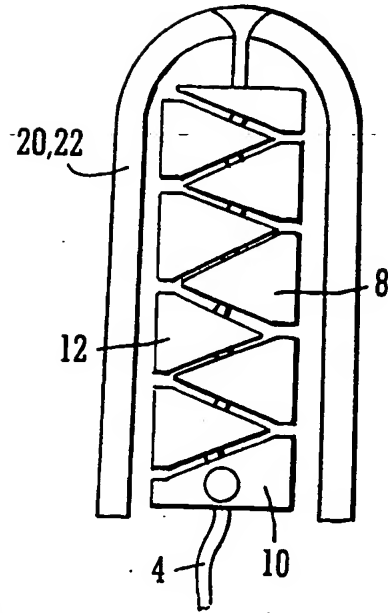


FIG. 20

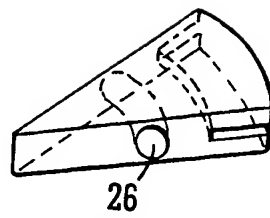


FIG. 19

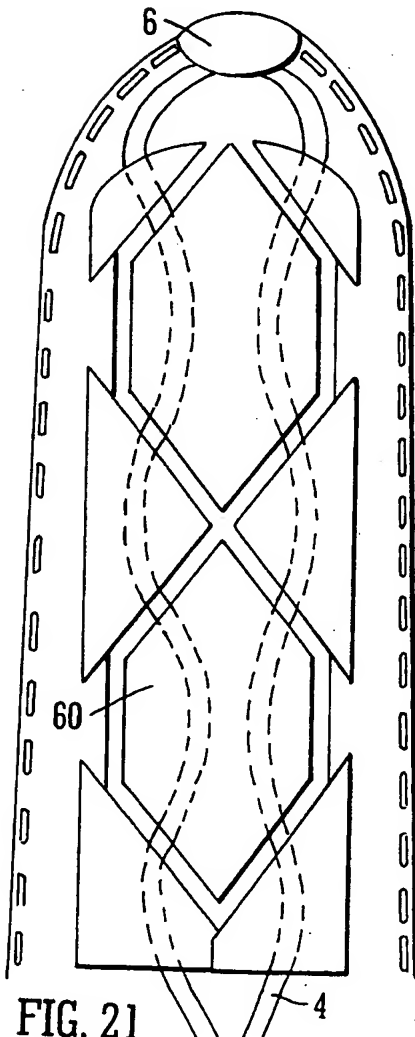


FIG. 21

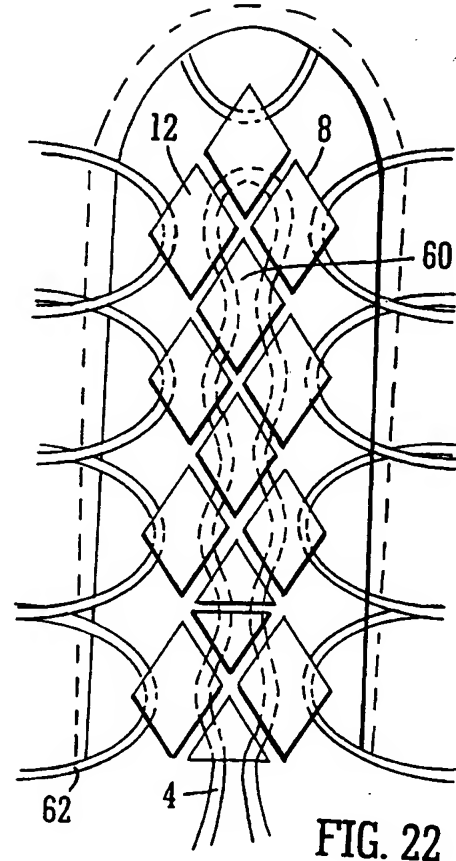


FIG. 22

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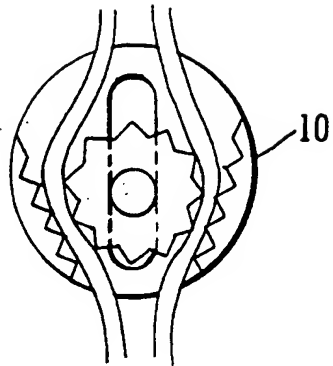


FIG. 23A

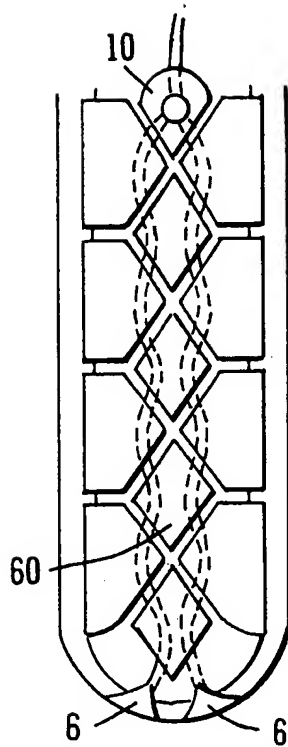


FIG. 23

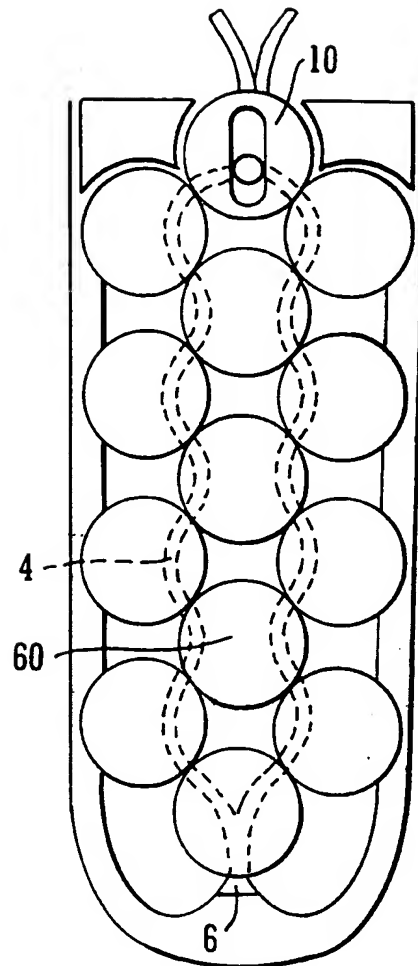


FIG. 24

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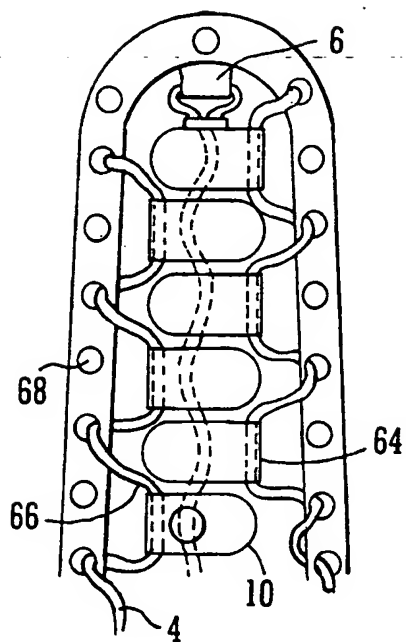


FIG. 25

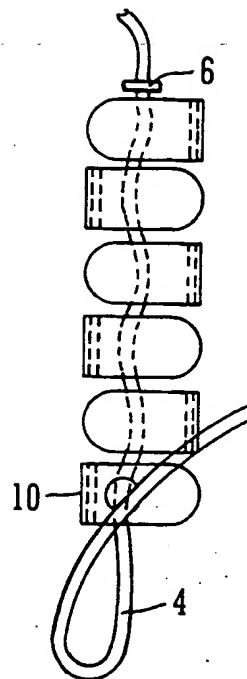


FIG. 26

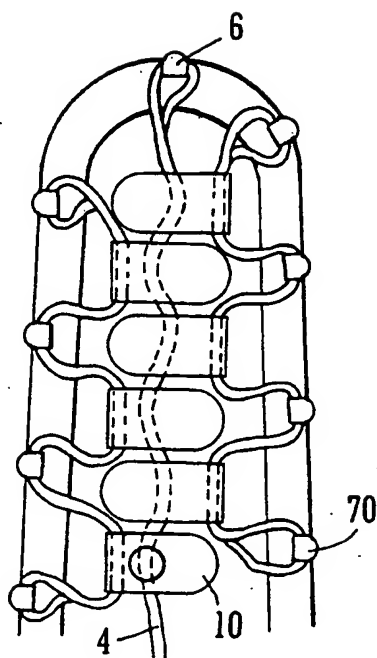


FIG. 27

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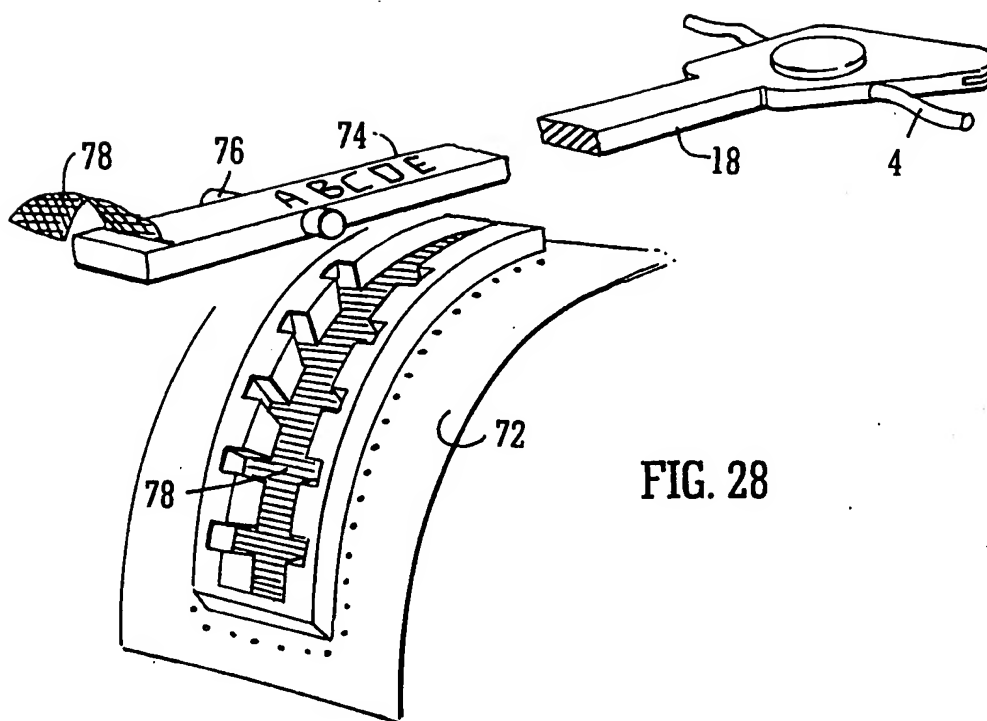


FIG. 28

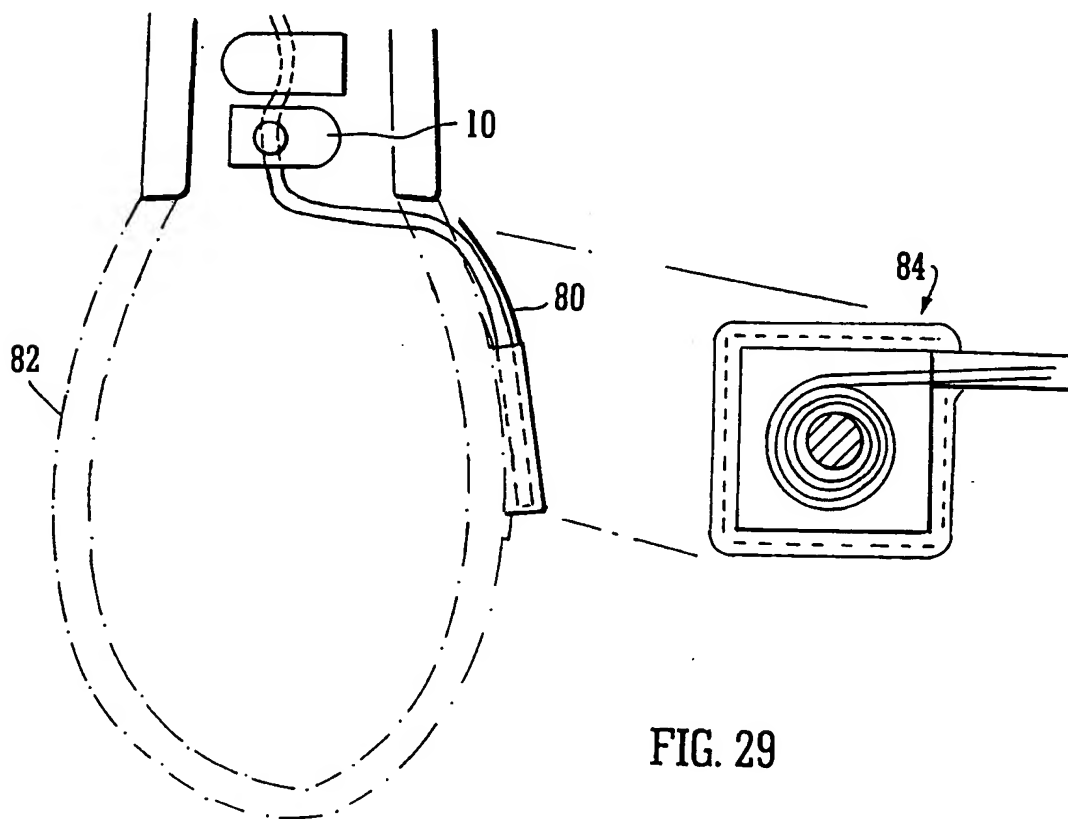


FIG. 29

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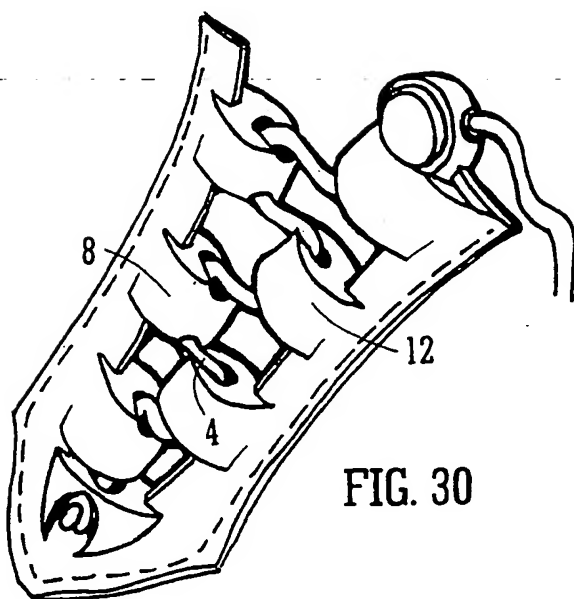


FIG. 30

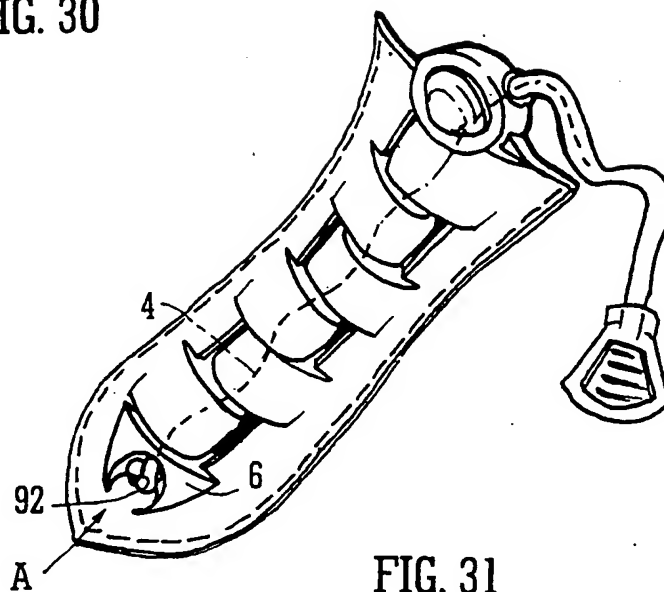


FIG. 31

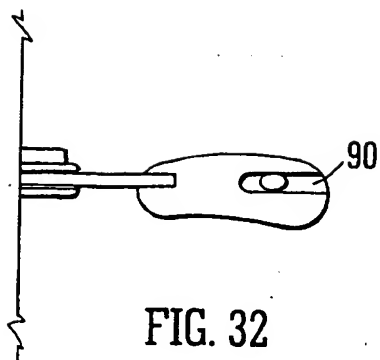


FIG. 32

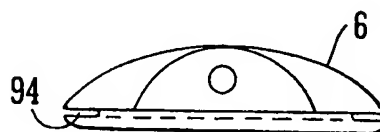


FIG. 33

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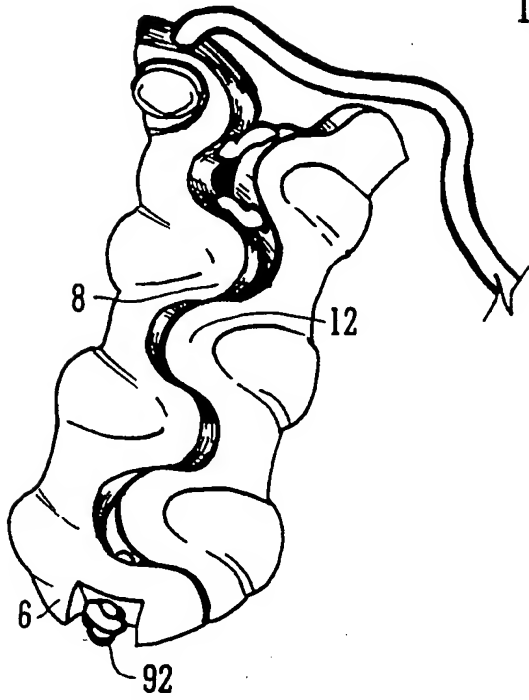


FIG. 34

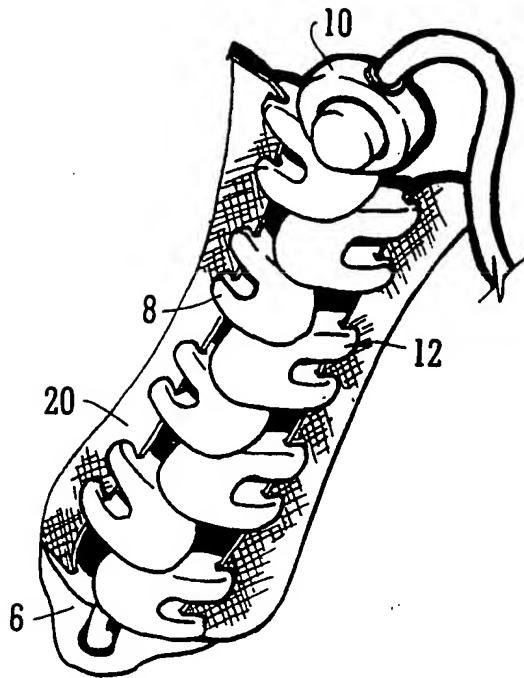


FIG. 37

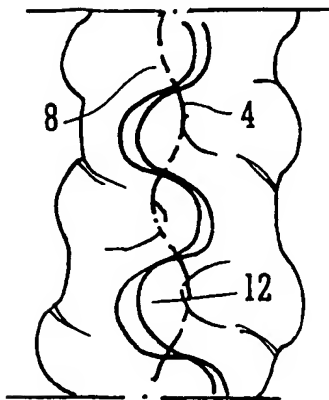


FIG. 35

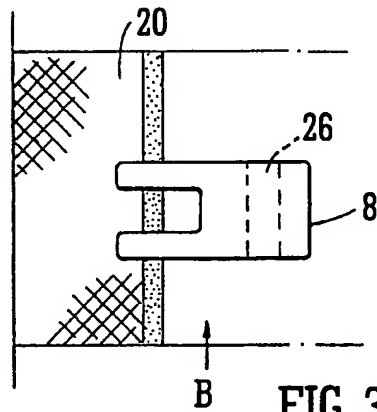


FIG. 38



FIG. 36

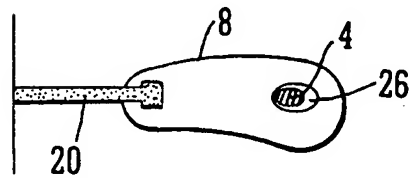


FIG. 39

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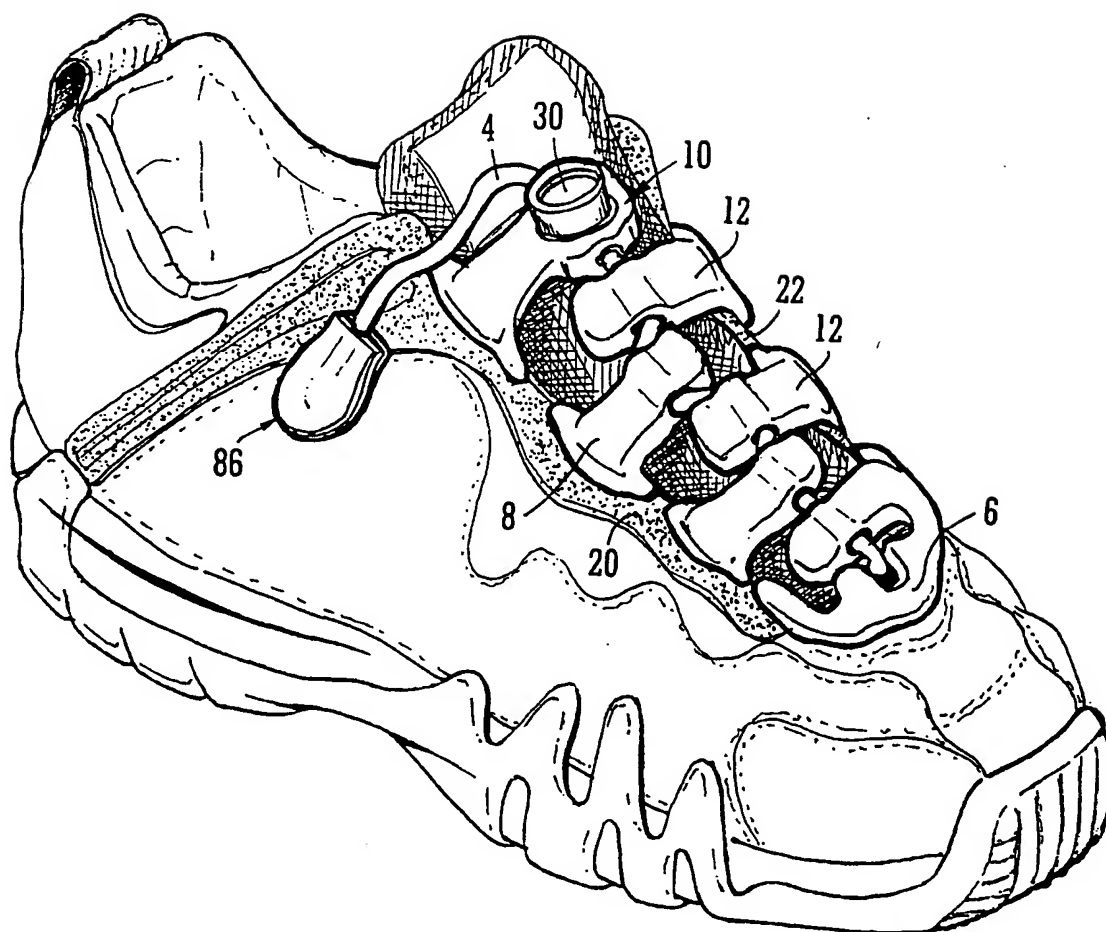


FIG. 40

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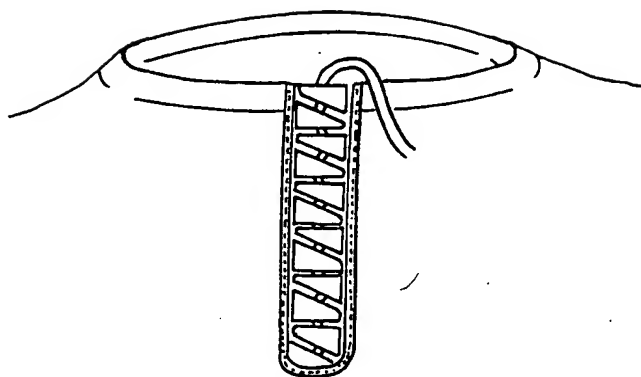


FIG. 41

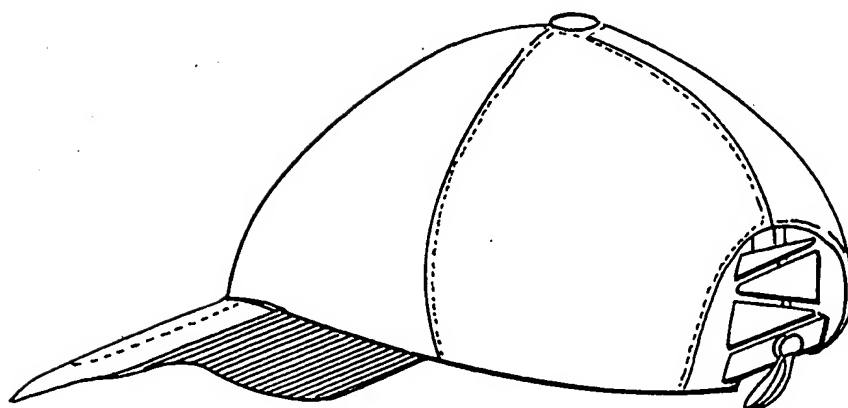


FIG. 42

INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 00/00858

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A43C1/00 A43C3/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 A43C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 97 28713 A (TATE AARN) 14 August 1997 (1997-08-14) knot or enlargement 63 figures 11-16, 18, 20	1, 2, 4-9, 11
X	DE 93 05 309 U (LEE JUN-SEOK) 15 July 1993 (1993-07-15) figure 1	1-5, 7, 11
X	DE 298 14 659 U (HANSEN & HEINZ OEG SPORTS MARK) 29 October 1998 (1998-10-29) claim 1; figures	1-5, 7, 11 10
A		
X	FR 2 565 795 A (BOULIER MAURICE) 20 December 1985 (1985-12-20) claims 1-4; figures 1-4	1, 2, 4-7, 11
	-/--	

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

7 June 2000

Date of mailing of the international search report

19/06/2000

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Claudel, B

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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X	FR 2 692 450 A (SPORTIVA SRL) 24 December 1993 (1993-12-24) claims; figures ----	1-4, 7, 10
A	WO 98 06288 A (RAKHMATULLIN ILDUS NAILIEVICH) 19 February 1998 (1998-02-19) abstract; figures ----	1, 10, 11
A	US 1 995 243 A (CHARLES J CLARKE) 19 March 1935 (1935-03-19) figures -----	10

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International Application No

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